

CLAIMS:

1. A method for quantitative determination of arsenic concentration in a water sample in the field, wherein the water sample comprises phosphates, the method comprising:

- 5 (a) preparing a first and a second sample aliquot;
 - (b) adding a reducing agent to a first sample aliquot to reduce arsenic in the aliquot to an arsenite state;
 - (c) adding a color reagent to the first and second sample aliquots, whereby phosphates in the first aliquot and both phosphates and arsenates in the second aliquot are converted into color complexes;
 - 10 (d) using optical probes to measure light absorbance of the color complexes formed in each aliquot; and
 - (e) using the measured light absorbances for the two aliquots to calculate the arsenic concentration in the groundwater sample,
- 15 wherein the optical probes are disposed in a portable colorimeter.

2. The method of claim 1, further comprising the step of adding an oxidizing agent to the second sample aliquot to oxidize arsenic in the aliquot to an arsenate state.

- 20
3. The method of claim 1 wherein the optical probe comprises infrared radiation having a wavelength of about 880 nm.

- 25
4. The method of claim 1 wherein the color complexes comprise molybdenum blue.

- 30
5. The method of claim 4 wherein the color reagent comprises potassium antimonyl tartrate, wherein the water sample is a groundwater sample, and wherein the proportion of color reagents added to groundwater sample aliquots is increased by about a factor of 10 over conventional Johnson and Pilson formulations used for seawater analysis.

6. The method of claim 1 wherein an optical probe comprises:
a cuvette to hold a sample aliquot;

a light emitting diode which is configured to radiate light on to the cuvette;
a photodetector for measuring the intensity of light transmitted through the
held sample aliquot; and
an electronic component to process the voltage output of the photo detector.

5

7. The method of claim 1 wherein using optical probes comprises using a pair of optical probes that are disposed in a dual-beam arrangement in the portable colorimeter, and using a first probe in the pair to measure light absorbance in the first sample aliquot, and the second probe in the pair to measure light absorbance in the
10 second sample aliquot.

8. The method of claim 7 wherein the responses of the optical probes in the pair are normalized with respect to each other.

15 9. The method of claim 1 wherein the light absorbance in the first and the second sample aliquots is measured sequentially.

10. The method of claim 1 wherein the light absorbance in the first and second sample aliquots is measured concurrently.

20

11. A colorimeter for quantitatively determining arsenic concentrations in a water sample, the colorimeter comprising:

at least one channel for measuring light absorbance in a water sample aliquot, wherein a channel comprises:

25

a cuvette for holding the water sample aliquot;
a source of light that is configured to direct light on to the held water sample aliquot; and
a photodetector to measure the intensity of light transmitted through the held water sample aliquot; and

30

electronic components to process a voltage output of the photodetector;
wherein the channel and the electronic components are housed in a portable case.

12. The colorimeter of claim 11, wherein the source of light comprises an infrared light emitting diode operating at a wavelength of about 880 nm.

13. A dual-channel colorimeter for determining arsenic concentrations in a water sample, the colorimeter comprising:

a portable case in which disposed are:

5 a pair of cuvettes to hold test and reference aliquots;
 a dual beam arrangement of light incident on the pair of cuvettes;
 a respective pair of photodetectors configured to measure the intensity
of light transmitted through the pair of cuvettes; and
 electronic components to process the output voltages of the
10 photodetectors;
 an electronic display for displaying the processed output voltages.

14. The dual-channel colorimeter of claim 13 comprising a microcontroller to sequence readings of the output voltages of the pair of photodetectors.

15. The dual-channel colorimeter of claim 13 further comprising an internal power source.

20 16. The dual-channel colorimeter of claim 13 wherein the portable case further comprises desiccating means to counteract humidity.

17. The dual-channel colorimeter of claim 13, wherein a dual beam arrangement of light comprises at least an infrared light emitting diode.

25 18. The dual-channel colorimeter of claim 13 wherein the response of a channel is normalized with respect to the response of the other channel using an inter-channel calibration procedure.